CLAIMS LISTING

Cancel original Claims 1-56 and add new Claims 57-111.

57. (new) A process for reducing HAPs in an air stream to ultra-low emissions limits comprising the steps of:

passing an air stream containing HAPs through a bed of synthetic adsorbent containing a styrenic polymer to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits;

passing a regenerating air stream substantially free of HAPs at an elevated temperature to fluidize the spent synthetic adsorbent and to desorb the HAPs on the spent synthetic adsorbent to regenerate the spent synthetic adsorbent so that it can reduce the HAPs in an air stream containing HAPs to a predetermined ultra-low emissions standard, the desorbed HAPs reporting to the regenerating air stream to form an off gas; and

cooling the regenerated spent synthetic adsorbent.

58. (new) Wherein the regeneration of the spent synthetic adsorbent is carried out under a partial vacuum.

59. (new) The process according to claim 57 including the step of oxidizing the off gas containing HAPs to oxidize the HAPs to environmentally acceptable compounds.

60. (new) The process according to claim 59 wherein the off gas is oxidized by treating the off gas with a catalytic oxidizer.

61. (new) The process according to claim 59 wherein the off gas is oxidized by thermally treating the off gas with an oxidizer.

62. (new) The process according to claim 59 wherein the off gas is oxidized employing a UV/oxidation system.

63. (new) The process according to claim 59 wherein the oxidized off gas is scrubbed employing a caustic scrubbing media selected from the group consisting of a caustic scrubber fluid and a basic scrubber solid.

64. (new) The process according to claim 63 wherein the scrubbed off gas is passed through an adsorption bed to remove by-products from the oxidizing step.

65. (new) The process according to claim 57 wherein the synthetic adsorbent is hydrophobic.

66. (new) The process according to claim 57 wherein the regenerating air stream is heated by passing it through warm regenerated synthetic adsorbent to cool the regenerated synthetic adsorbent and to warm the regenerating air stream before it is used to regenerate spent synthetic adsorbent.

67. (new) The process according to claim 57 wherein the air stream containing HAPs is cooled prior to passing through the bed of synthetic adsorbent.

68. (new) The process according to claim 57 wherein the desorbed HAPS in the off gas are absorbed onto another absorbent for capture.

69. (new) The process according to claim 57 including the step of recovering the desorbed HAPs in the off gas.

70. (new) The process according to claim 57 wherein the spent synthetic adsorbent is heated prior to regeneration.

71. (new) The process according to claim 70 wherein the spent synthetic adsorbent is heated with microwaves.

72. (new) A process for reducing HAPs in an air stream to ultra-low emissions limits comprising the steps of:

passing an air stream containing HAPs through a bed of synthetic adsorbent containing styrenic polymers to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits;

passing a regenerating stream of gas with an oxygen level less than air and substantially free of HAPs at an elevated temperature and at above atmospheric pressure to fluidize the spent synthetic adsorbent to a highly turbulent state and to desorb the HAPs adsorbed on the spent synthetic adsorbent to regenerate the spent synthetic adsorbent so that it can reduce the HAPs in an air stream containing HAPs to a predetermined ultra-low emissions standard, the spent synthetic adsorbent heated to an elevated temperature during the HAPs desorbing, the desorbed HAPs reporting to the regenerating stream of gas to produce an off gas; and

cooling the regenerated spent synthetic adsorbent.

73. (new) The process according to claim 72 wherein the regenerating stream of gas is an inert gas stream.

74. (new) The process according to claim 72 wherein the regenerating stream of gas is substantially free of oxygen.

75. (new) The process according to claim 72 wherein the cooled regenerated synthetic adsorbent is recycled back into the process to form the bed of synthetic adsorbent.

76. (new) The process according to claim 72 wherein the off gas is cooled.

77. (new) The process according to claim 76 wherein the cooled off gas is passed through an adsorbent to reduce the HAPs in the cooled off gas.

78. (new) The process according to claim 72 wherein the temperature of the spent synthetic absorbent is controlled during the regeneration step to prevent oxidation of the synthetic adsorbent.

79. (new) The process according to claim 72 wherein the regeneration of the spent synthetic adsorbent is carried out under a partial vacuum.

80. (new) The process according to claim 72 including the step of oxidizing the off gas to oxidize the HAPs to environmentally acceptable compounds.

81. (new) The process according to claim 80 wherein the off gas is oxidized employing a catalytic oxidizer.

82. (new) The process according to claim 80 wherein the off gas is oxidized employing a UV/oxidation system.

83. (new) The process according to claim 80 wherein the oxidized off gas is scrubbed employing a caustic scrubbing media selected from the group consisting of a caustic scrubber fluid and a basic scrubber solid.

84. (new) The process according to claim 83 wherein the scrubbed off gas is passed through an adsorption bed to remove by-products from the oxidizing step.

85. (new) The process according to claim 72 wherein the synthetic adsorbent is hydrophobic.

86. (new) The process according to claim 72 wherein the oxygen content of the regeneration gas stream is limited to prevent oxidation of the synthetic adsorbent during regeneration.

87. (new) The process according to claim 72 wherein oxygen is introduced into the off gas and the HAPs in the off gas are oxidized to form oxidized by-products and

passing the oxidized by-products through a caustic scrubbing media selected from the group consisting of a caustic scrubber fluid and solid basic adsorbent to removed the oxidized by-products.

88. (new) The process according to claim 87 wherein the HAPs are oxidized in a thermal oxidizer.

89. (new) The process according to claim 87 wherein the HAPs are oxidized in a catalytic oxidizer.

90. (new) The process according to claim 87 wherein the oxidized by-products stream after passing through the caustic scrubber or solid basic adsorbent is passed through an adsorbent to remove the remaining oxidized by-products.

91. (new) The process according to claim 72 wherein the regenerating air stream is heated by passing it through warm regenerated synthetic adsorbent to cool the regenerated synthetic adsorbent and to warm the regenerating air stream before it is used to regenerate the spent synthetic adsorbent.

92. (new) The process according to claim 72 wherein the air stream containing HAPs is cooled prior to passing through the bed of synthetic adsorbent.

93. (new) The process according to claim 72 wherein the desorbed HAPS in the regenerating air stream are absorbed onto another absorbent for capture.

94. (new) The process according to claim 72 including the step of recovering the desorbed HAPs from the regenerating air stream.

95. (new) The process according to claim 70 wherein the spent adsorbent is heated prior to regeneration.

96. (new) A process for reducing HAPs in an air stream to ultra-low emissions limits comprising the steps of:

passing an air stream containing HAPs through a bed of synthetic hydrophobic adsorbent containing styrenic polymer to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits;

passing a regenerating stream of gas with an oxygen level less than air and substantially free of HAPs at an elevated temperature and at an elevated pressure above atmospheric pressure to fluidize the spent synthetic adsorbent to a highly turbulent state and to desorb the HAPs adsorbed on the spent synthetic adsorbent to regenerate the spent synthetic adsorbent so that it can reduce the HAPs in an air stream containing HAPs to a predetermined ultra-low emissions standard, the spent synthetic adsorbent heated to an elevated temperature during the regeneration, the desorbed HAPs reporting to the regenerating stream of gas to produce a HAPS containing gas stream; and

cooling the regenerated spent synthetic adsorbent; and

passing an air stream containing HAPs through a bed of the regenerated synthetic adsorbent to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the regenerated synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits.

97. (new) The process according to claim 96 wherein the regenerating stream of gas is an inert gas stream.

98. (new) The process according to claim 96 wherein the regenerating stream of gas is substantially free of oxygen.

99. (new) The process according to claim 96 wherein the air stream containing HAPs is cooled before passing through the bed of synthetic hydrophobic adsorbent.

100. (new) The process according to claim 99 wherein the cooled HAPs containing gas stream is passed through an adsorbent to reduce the HAPs in the cooled HAPs containing gas stream.

101. (new) The process according to claim 96 wherein the temperature of the spent synthetic absorbent is controlled during the regeneration step to prevent oxidation of the synthetic adsorbent.

102. (new) The process according to claim 96 including the step of oxidizing the off gas to oxidize the HAPs to environmentally acceptable compounds.

103. (new) The process according to claim 102 wherein the oxidized off gas is scrubbed employing a caustic scrubber media consisting of caustic scrubber fluid and a basic scrubber solid.

104. (new) The process according to claim 96 wherein the HAPs in the HAPs containing gas stream are oxidized to form an oxidized gas stream with oxidized by-products and passing the oxidized gas stream through a caustic scrubber media consisting of caustic scrubber fluid and basic adsorbent solid.

105. (new) The process according to claim 104 wherein the oxidized gas stream after passing through the caustic scrubbing media is passed through an adsorbent to remove oxidized by-products.

106. (new) The process according to claim 96 wherein the regenerating air stream is heated by passing it through warm regenerated synthetic adsorbent to cool the regenerated synthetic adsorbent and to warm the regenerating air stream before it is used to regenerate the spent synthetic adsorbent.

107. (new) The process according to claim 96 wherein the air stream containing HAPs is cooled prior to passing through the bed of synthetic adsorbent.

108. (new) The process according to claim 96 wherein the desorbed HAPS in the HAPs containing gas stream are absorbed onto another absorbent for capture.

109. (new) The process according to claim 96 including the step of recovering the desorbed HAPs from the HAPs containing gas stream.

110. (new) The process according to claim 96 wherein the spent adsorbent is heated prior to regeneration.

111. (new) A process for reducing HAPs in an air stream to ultra-low emissions limits comprising the steps of:

passing an air stream containing HAPs through a bed of synthetic hydrophobic adsorbent containing styrenic polymer to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits;

passing a regenerating stream of inert gas substantially free of HAPs at an elevated temperature and at an elevated pressure above atmospheric pressure to fluidize the spent synthetic adsorbent to a highly turbulent state and to desorb the HAPs adsorbed on the spent synthetic adsorbent to regenerate the spent synthetic adsorbent so that it can reduce the HAPs in an air stream containing HAPs to a predetermined ultra-low emissions standard, the spent synthetic adsorbent heated to an elevated temperature during the regeneration, the desorbed HAPs reporting to the regenerating stream of gas to produce a HAPS containing gas stream;

cooling the regenerated spent synthetic adsorbent;

cooling the HAPs containing gas stream;

passing the cooled HAPs containing gas stream through an adsorbent to capture the HAPs; and

passing an air stream containing HAPs through a bed of the regenerated synthetic adsorbent to produce an off gas with the HAPs reduced to a predetermined ultra-low emissions standard until the regenerated synthetic adsorbent is spent and can no longer reduce the HAPs in the air stream to the ultra-low emissions limits.